Title: Method and System for Dynamic Learning Through...
Inventor: Xin NIU and Nickhil JAKATDAR
Application No.: To Be Assigned
Docket No.: 509982001400

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Grating Top CD 2

Inflection Point 4

Width at Inflection Point 8

Grating Thickness 6

Height at Inflection Point 14

Underlying Thickness 12

Grating Bottom CD 10

FIG. 1

Title: Method and System for Dynamic Learning Through ...
Inventor: Xin NIU and Nickhil JAKATDAR
Application No.: To Be Assigned
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FIG. 2

Title: Me... d and System for Dynamic Learning Through ...
Inventor... NIU and Nickhil JAKATDAR
Application No.: To Be Assigned
Docket No.: 509982001400

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```
┌─────────────────────────────────┐
│  Receiving a second set of       │  300
│  measurements associated with    │
│  second actual profile           │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│  Obtain second actual spectrum   │  302
│  signal data                     │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│  Compare second actual spectrum  │  304
│  signal data to spectrum signal  │
│  data stored in dynamic library  │
└─────────────────────────────────┘
              │
              ▼
```

306   308

```
┌──────────────┐         ╱╲
│  Retrieve    │   YES  ╱    ╲
│  associated  │◄──────╱ Does   ╲
│  matching    │       ╲ match   ╱
│  trial       │       ╲satisfying╱
│  profile     │        ╲preset  ╱
└──────────────┘        ╲discrepancy╱
                         ╲criteria╱
                          ╲set exist?╱
                            ╲  ╱
                             ▼ NO
┌─────────────────────────────────┐
│  Search to determine closest     │  312
│  matching trial spectrum signal  │
│  data                            │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│  Retrieve closest matching       │  314
│  profile                         │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│  Use optimization technique to   │  224
│  generate closer matches         │
└─────────────────────────────────┘
```

FIG. 3

Title: Method and System for Dynamic Learning Through ...
Inventor: X NIU and Nickhil JAKATDAR
Applicatio : To Be Assigned
Docket No.. 309982001400

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FIG. 4

Title: Met[●]nd System for Dynamic Learning Through ...
Inventor: J[●]IU and Nickhil JAKATDAR
Application No.: To Be Assigned
Docket No.: 509982001400

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Computer 98

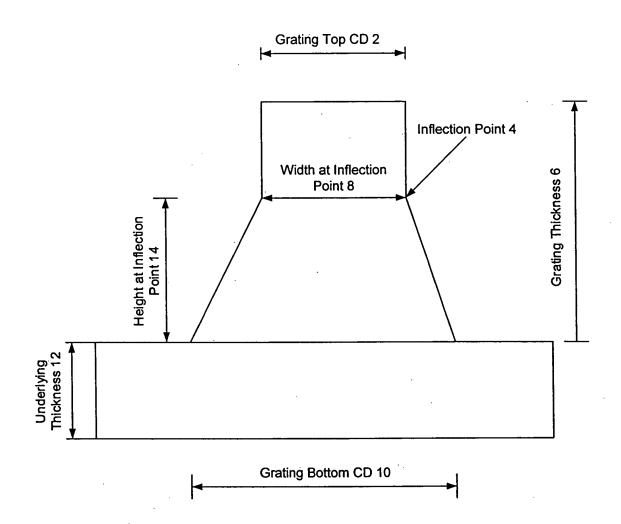| 94 |
| Dynamic Library |
| Generator |

| 96 |
| Output Device |

FIG. 5

Title: Method and System for Dynamic Learning Through ...
Inventor: Xin NIU and Nickhil JAKATDAR
Application No.: To Be Assigned
Docket No.: 509982001400

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Entry ID	Shape - profile data	Signal spectrum data	Number of matches

600

FIG. 6

Title: Method and System for Dynamic Learning Through ...
Inventor: NIU and Nickhil JAKATDAR
Applica o.: To Be Assigned
Docket No.: 509982001400

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tan(Ψ)

FIG. 7

Title: Meth●●d System for Dynamic Learning Through ...
Inventor: X●●●U and Nickhil JAKATDAR
Application No.: To Be Assigned
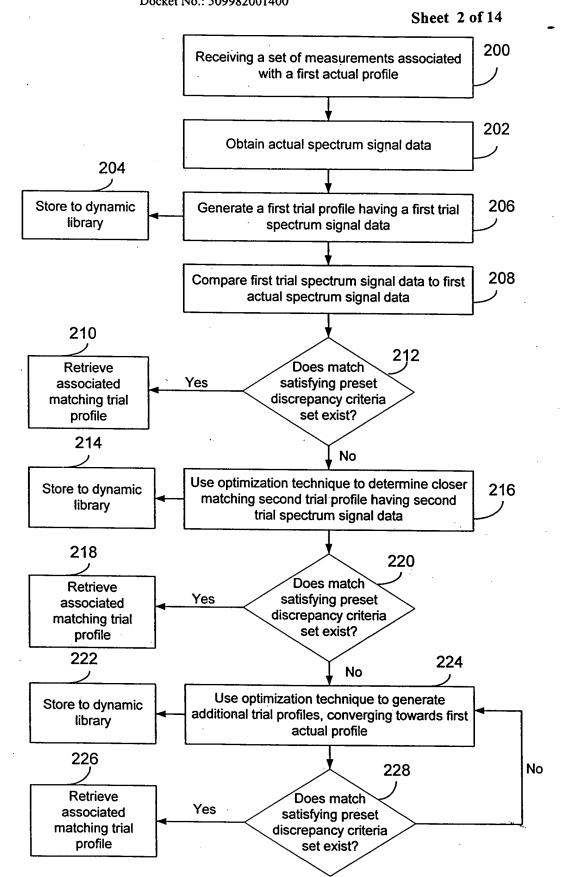Docket No.: 509982001400
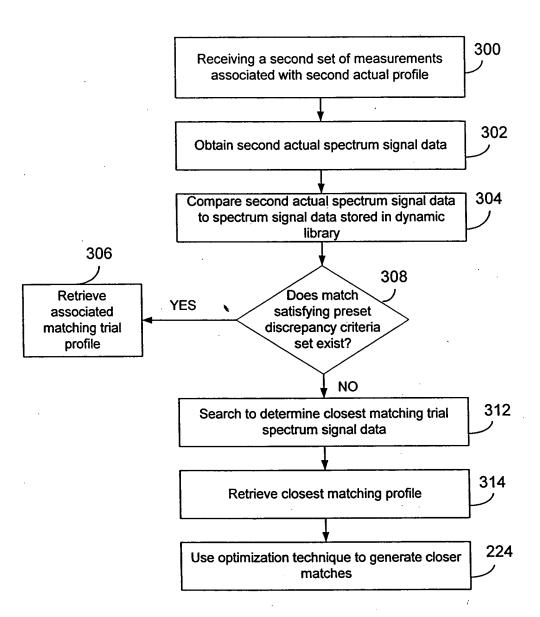
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cos(Δ)

FIG. 8

Title: Method and System for Dynamic Learning Through ...
Inventor: Xin NIU and Nickhil JAKATDAR
Application No.: To Be Assigned
Docket No.: 509982001400

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```
┌─────────────────────────────────────┐
│                                      │  900
│         Setup regression job         │
│                                      │
└─────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────┐
│                                      │  902
│          Take measurements           │
│                                      │
└─────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────┐
│                                      │  904
│       Run regression optimization    │
│                                      │
└─────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────┐
│                                      │  906
│   Analyze regression results and adjust │
│           parameter ranges           │
└─────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────┐
│                                      │  908
│       Initialize variable LIB = 0    │
│                                      │
└─────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────┐
│                                      │  910
│        Take actual measurement       │
│                                      │
└─────────────────────────────────────┘
```

FIG. 9

Title: Method and System for Dynamic Learning Through ...
Invento... NIU and Nickhil JAKATDAR
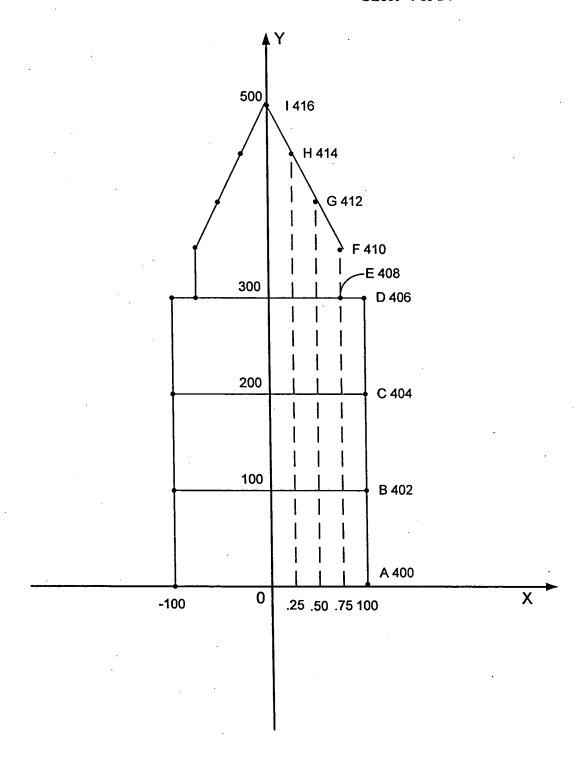Applica... No.: To Be Assigned
Docket No.: 509982001400

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```
                      ┌─────────────────────────┐
                      │  Take actual measurements│──── 910
                      └─────────────────────────┘
                                  │
                                  ▼
                      ┌─────────────────────────┐
                      │  Run real-time regression│──── 1002
                      └─────────────────────────┘
                                  │
                                  ▼
                      ┌─────────────────────────┐
                      │  Optimization procedure  │
                      │  selects an instance of  │──── 1004
                      │    parameter values      │
                      └─────────────────────────┘
                                  │
                                  ▼
                            ◇ 1006
                      Are parameter
       ┌──────────── values stored in ────────────┐
       │  YES         database?              NO    │
       ▼                                           ▼
┌────────────────┐                    ┌─────────────────────────┐
│Search library  │                    │Store parameter values   │──── 1010
│for simulated   │─ 1008              │    in database          │
│signal          │                    └─────────────────────────┘
│corresponding to│                                  │
│parameter values│                                  ▼
└────────────────┘                    ┌─────────────────────────┐
       │                              │Run electromagnetic      │──── 1012
       │                              │    simulation           │
       │                              └─────────────────────────┘
       │                                            │
       │                                            ▼
       │                              ┌─────────────────────────┐
       │                              │Store simulated signal   │──── 1014
       │                              │    in database          │
       │                              └─────────────────────────┘
       │                                            │
       │                                            ▼
       │                              ┌─────────────────────────┐
       └─────────────────────────────│Compare simulated signal │──── 1016
                                      │  to measured signal     │
                                      └─────────────────────────┘
```
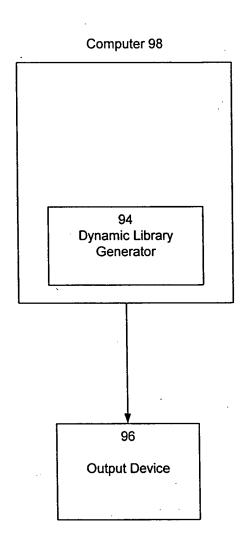
FIG. 10

Title: Method and System for Dynamic Learning Through ...
Inventor: Xin NIU and Nickhil JAKATDAR
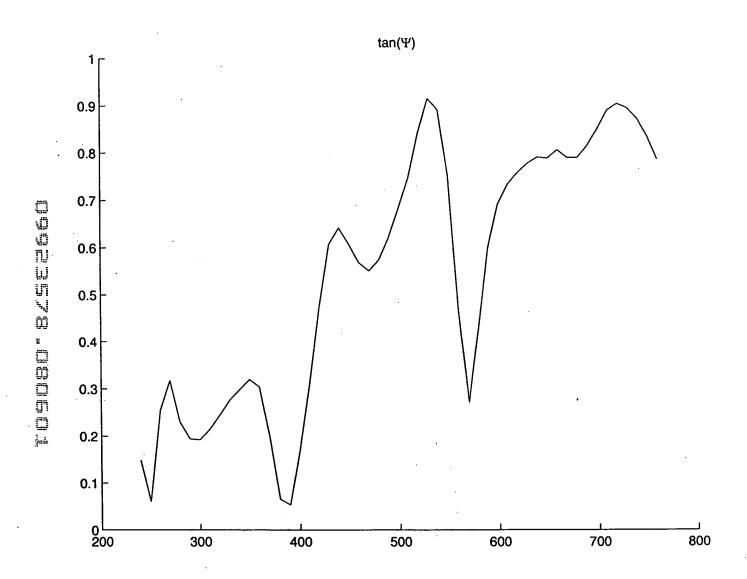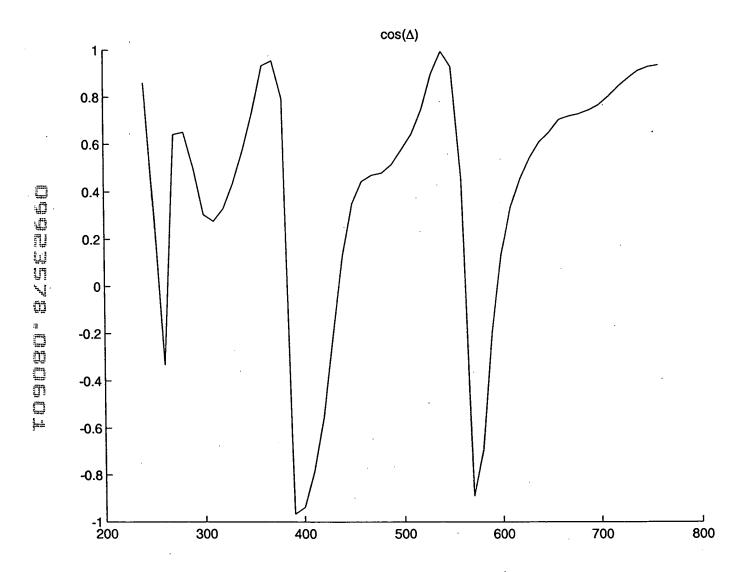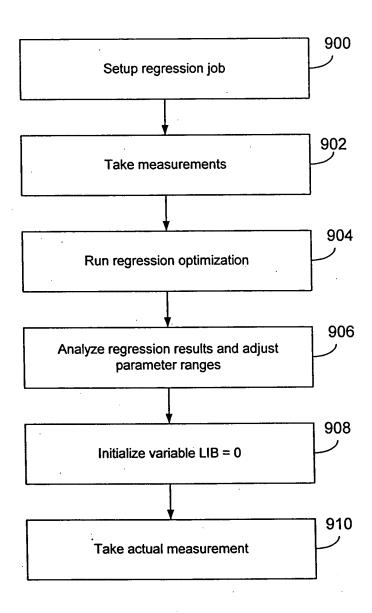Application No.: To Be Assigned
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```
                                    ┌─────────────────────────┐
                                    │  Compare simulated signal to │ ──── 1016
                                    │     measured signal      │
                                    └─────────────────────────┘
                                               │
    1100                                       ▼
┌─────────────────────┐          NO      ╱ Is GOF > GOF ╲    1102
│ Continue optimization; Go │ ◄────────── ╲  treashold?  ╱
│      to 1004        │                    ╲           ╱
└─────────────────────┘                         │
                                               ▼
                                    ┌─────────────────────────┐
                                    │     Stop optimization    │ ──── 1104
                                    └─────────────────────────┘
                                               │
                                               ▼
                                    ┌─────────────────────────┐
                                    │     Display results      │ ──── 1106
                                    └─────────────────────────┘
                                               │
    1110                                       ▼
┌─────────────────────┐          NO      ╱ Check Database: ╲    1108
│    Set LIB = 0?     │ ◄────────── ╲ have all parameter ╱
│    Go to 910        │              ╲ combinations been ╱
└─────────────────────┘               ╲    entered?    ╱
                                               │ YES
                                               ▼
                                    ┌─────────────────────────┐
                                    │ Compile database into library │ ──── 1112
                                    └─────────────────────────┘
                                               │
                                               ▼
                                    ┌─────────────────────────┐
                                    │      Cluster library     │ ──── 1114
                                    └─────────────────────────┘
                                               │
                                               ▼
                                    ┌─────────────────────────┐
                                    │       Set LIB = 1        │ ──── 1116
                                    └─────────────────────────┘
```

FIG. 11

Title: M████ and System for Dynamic Learning Through
Inventor███ NIU and Nickhil JAKATDAR
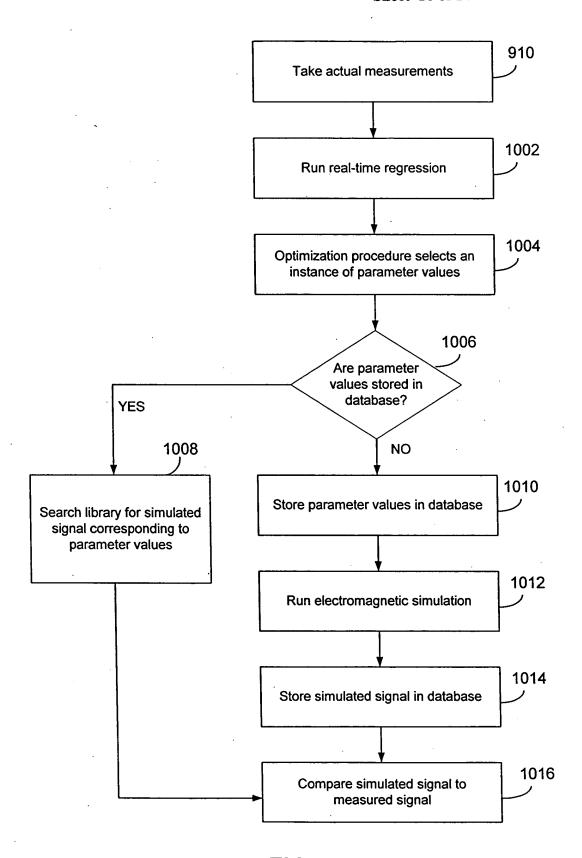Application No.: To Be Assigned
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```
                                              ┌─── 1200
                         ╱╲
   ┌──────────────────┐ NO ╱    ╲
   │ Continue library │◄──┤ Is LIB = 1? │
   │ generation;      │    ╲    ╱
   │ Go to step 910   │     ╲╱
   └──────────────────┘      │
         │                   │
        1202                 ▼
                    ┌──────────────────┐ 1204
                    │ Take measurement │
                    └──────────────────┘
                             │
                             ▼
                    ┌──────────────────────┐ 1206
                    │ Search library for   │
                    │ best match           │
                    └──────────────────────┘
                             │
         1210                ▼
   ┌──────────────────┐   ╱╲
   │                  │NO ╱    ╲ 1208
   │ Display error    │◄─┤ Is GOF > GOF │
   │ message          │   ╲ threshold? ╱
   └──────────────────┘    ╲    ╱
         │                  ╲╱
         │                   │ YES
         │                   ▼
         │          ┌──────────────────┐ 1212
         │          │ Display match    │
         │          └──────────────────┘
         │                   │
         │                   ▼
         │          ┌──────────────────────────┐ 1214
         └─────────►│ Widen regression         │
                    │ analysis range           │
                    └──────────────────────────┘
                             │
                             ▼
                    ┌──────────────────┐ 1216
                    │ Set LIB = 0;     │
                    │ Go to 906        │
                    └──────────────────┘
```

FIG. 12

Title: Method and System for Dynamic Learning Through ...
Inv⬤ Xin NIU and Nickhil JAKATDAR
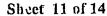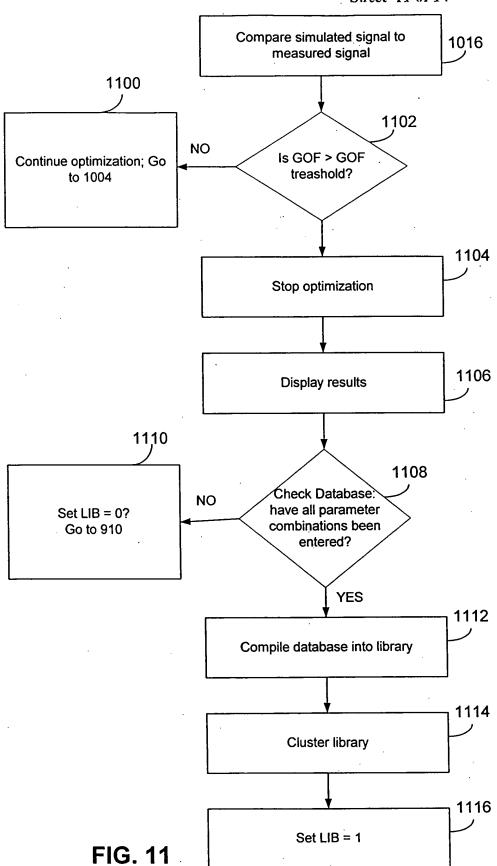Ap⬤ion No.: To Be Assigned
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```
                    ┌─────────────────────────┐  ┌─ 1300
                    │   Setup regression;     │
                    │     Counter K = 0       │
                    └─────────────────────────┘
                                │
                                ▼
                    ┌─────────────────────────┐  ┌─ 1302
                    │    Take measurements     │
                    └─────────────────────────┘
                                │
                                ▼
                    ┌─────────────────────────┐  ┌─ 1304
                    │ Run regression optimization│
                    └─────────────────────────┘
                                │
                                ▼
                             ◇ 1306
                    ◇ Is GOF > GOF threshold? ◇
               NO ◇                          ◇
                  └────────────              YES
                                │
                                ▼
                    ┌─────────────────────────┐  ┌─ 1308
                    │      Display result      │
                    └─────────────────────────┘
                                │
                                ▼
   1312              ┌─────────────────────────┐  ┌─ 1310
┌───────────┐       │ Store resultant parameter │
│  Counter  │◄──────│  vallues in database 1   │
│  K = K+1  │        └─────────────────────────┘
└───────────┘
      │
      ▼
   ◇ K < 20 ? ◇    NO    ┌─────────────────────┐  ┌─ 1316
YES ◇         ◇─────────►│     Set LIB = 0     │
      ◇ 1314               └─────────────────────┘
                                    │
                                    ▼
                          ┌─────────────────────────┐  ┌─ 1318
                          │ Determine new parameter  │
                          │  ranges and resolutions  │
                          └─────────────────────────┘
```

FIG. 13

Title: Method and System for Dynamic Learning Through ...
Inventor: Xin NIU and Nickhil JAKATDAR
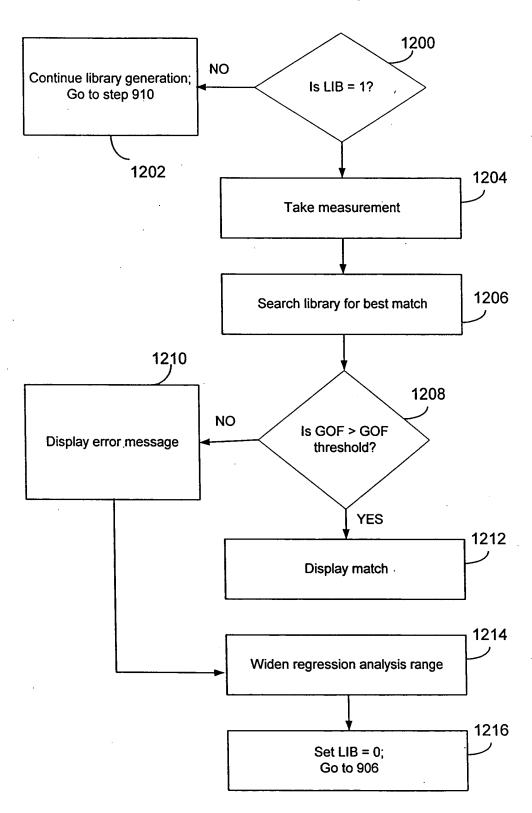Application No.: To Be Assigned
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1400

Is LIB = 0 ?

YES 1402

1416
Take measurement

1402
Switch portion of processors to background library generation

1418
Search library for best match

1404
Continue running regression analysis on first set of processors and library generation on second set of processors

1420
Is GOF > GOF threshold ?

NO

1406
Store library generation parameters and signals in database 2

1422 YES

Display match

1408
Is generation complete on database 2 ?

NO

1424
Display error message

YES

1426
Wider range for regression analysis

1410
Compile library from database 2

1428
Set LIB = 0;
Go to 1302

1412
Cluster library

1414
Set LIB = 1

FIG. 14